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LISTING OF CLAIMS

CLAIMS:

What is claimed is:

1. (Original) A method for imparting a watermark onto a digitized image, said method comprising:

providing a digitized image having at least one image plane, said image plane being represented by an image array having a plurality of pixels, said pixel having at least one color component, said watermark being formed using a distinct watermarking plane represented by an array having a plurality of distinct watermarking elements, each of said distinct watermarking elements having an array position and having one-to-one positional correspondence with said image pixels, and

multiplying said brightness data associated with said at least one color component by a predetermined brightness multiplying factor, wherein said brightness multiplying factor is a corresponding distinct watermarking element, and said watermark has a invisibility classification.

2. (Original) A method as recited in claim 1, wherein said brightness multiplying factor has a relationship with a number taken from a random number sequence.

3. (Original) A method as recited in claim 2, wherein said relationship is a linear remapping to provide a desired modulation strength.

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1 4. (Original) A method as recited in claim 3, wherein said
2 modulation strength lies in the domain greater than or equal to
3 zero and less than or equal to 0.5.

4 5. (Original) A method for imparting a watermark onto a
5 digitized image comprising the steps of:

6 providing said digitized image comprised of a plurality of
7 pixels, wherein each of said pixels includes brightness data
8 that represents a brightness of at least one color; and

9 altering said brightness data associated with a plurality of
10 said pixels maintaining the hue and saturation of said
11 pixel.

12 6. (Original) A method as recited in claim 5, wherein said
13 image has I rows and J columns, and has a pixel in row i and
14 column j having at least one brightness, $Y(i,j)$, and the step of
15 altering includes:

16 adding to or subtracting from the brightness $Y(i,j)$ a different
17 small random value $e(i,j)$, wherein $1 \leq i \leq I$ and $1 \leq j \leq J$ are
18 the row and column indices of a pixel location in the image.

19 7. (Original) A method as recited in claim 6, wherein the step
20 of adding to or subtracting from includes making $e(i,j)$
21 proportional to an original brightness of the pixel.

22 8. (Original) A method as recited in claim 6, wherein color
23 components of the unaltered pixel are $X(i,j)$, $Y(i,j)$, and $Z(i,j)$,
24 and color components of the brightness altered pixel are $X'(i,j)$,
25 $Y'(i,j)$, and $Z'(i,j)$, and the step of adding to or subtracting
26 from includes setting $e(i,j) = d(i,j)Y(i,j)$, where $d(i,j)$ is a

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1 value selected from an array of random values within a range of 0
2 $\leq d(i,j) \leq 1$, such that the modified brightness $Y'(i,j) =$
3 $Y(i,j) + e(i,j) = Y(i,j) + d(i,j)Y(i,j)$, and $X'(i,j)/X(i,j) =$
4 $Z'(i,j)/Z(i,j) = Y'(i,j)/Y(i,j) = e(i,j) = 1 - d(i,j)$.

5 9. (Original) A method as recited in claim 8, wherein the step
6 of setting includes preserving ratios of color components in each
7 pixel.

8 10. (Original) A method as recited in claim 9, wherein the step
9 of preserving includes setting $X'(i,j)/X(i,j) = Z'(i,j)/Z(i,j) =$
10 $Y'(i,j)/Y(i,j) = 1 - d(i,j)$, wherein the color components of the
11 unaltered pixel are $X(i,j)$, $Y(i,j)$, and $Z(i,j)$, and the color
12 components of the brightness altered pixel are $X'(i,j)$, $Y'(i,j)$,
13 and $Z'(i,j)$.

14 11. (Original) A method for imparting a watermark onto a
15 digitized image comprising the steps of:

16 providing said digitized image comprised of a plurality of
17 pixels, wherein each of said pixels includes brightness data
18 that represents a brightness of at least one color, with
19 said image having I rows and J columns, and a pixel in row i
20 and column j having a brightness $Y(i,j)$; and

21 for a plurality i and at least one j adding to or
22 subtracting from the brightness $Y(i,j)$ a random value
23 $e(i,j)$, wherein $1 \leq i \leq I$ and $1 \leq j \leq J$ are the row and
24 column indices of a pixel location in the image.

25 12. (Original) A method as recited in claim 11, wherein $e(i,j)$
26 is in the domain 0 to 1 multiplied by $Y(i,j)$.

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1 13. (Original) A method for generating a watermarked image, the
2 method comprising:

3 imparting a watermark onto a digitized image having a
4 plurality of original pixels, each of said pixels having at
5 least one original pixel brightness value;

6 providing said digitized watermarking plane comprising
7 a plurality of watermarking elements, each element
8 having a watermark brightness multiplying factor and
9 having one-to-one positional correspondence with said
10 original pixels; and

11 producing a watermarked image by multiplying said
12 original brightness of each of said original pixels by
13 said brightness multiplying factor of a corresponding
14 one of said watermark elements.

15 14. (Original) A method comprising:

16 forming a watermarking plane including a plurality of elements
17 each having a brightness adding or subtracting factor, including
18 the steps of:

19 generating a secure random sequence of integers having
20 a first plurality of bits;

21 linearly remapping said random sequence to form a
22 remapped sequence of brightness multiplying factors to
23 provide a desired modulation strength;

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1 computing a discrete Fourier transform of said remapped
2 sequence to form a Fourier sequence having frequency
3 coordinates;

4 expanding said frequency coordinates to form an
5 expanded sequence;

6 computing an inverse discrete Fourier transform of said
7 expanded sequence to obtain a watermarking sequence of
8 values; and

9 deriving said brightness adding or subtracting values
10 of said elements of said watermarking plane based upon
11 said watermarking sequence of values.

12 15. (Original) A method for detecting a watermark in a marked
13 image, said method comprising:

14 providing said marked image marked by a watermarking plane,
15 said marked image having at least one color plane including
16 a plurality of image pixels, said watermarking plane having
17 a plurality of watermarking elements, wherein each of said
18 image pixels has at least one brightness value and each of
19 said watermarking elements has a brightness adding and/or
20 subtracting factor, including the steps of:

21 (a) reconstructing said watermarking plane;

22 (b) aligning said watermarking plane with said marked
23 image such that each watermarking element has a
24 corresponding image pixel;

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1 (c) providing a selector array and a visualizer image
2 of equal size, wherein said selector array has a
3 plurality of selector elements each having at least one
4 counter, and wherein said visualizer image has a
5 plurality of visualizer pixels each having at least one
6 brightness value, and wherein said visualizer pixels
7 represent a recognizable pattern when displayed;

8 (d) resetting said at least one counter to zero;

9 (e) placing said selector in an initial position by
10 aligning said selector elements with a plurality of
11 corresponding image pixels and a plurality of
12 corresponding watermarking elements;

13 (f) choosing a selector element and identifying a
14 corresponding watermarking element;

15 (g) identifying a first plurality of watermarking
16 elements that neighbor said corresponding watermarking
17 element;

18 (h) generating a first average that represents an
19 average of brightness multiplying factors of said first
20 plurality of watermarking elements;

21 (i) choosing a color plane of said marked image and
22 finding a corresponding image pixel;

23 (j) identifying a first plurality of neighboring pixels
24 that neighbor said corresponding image pixel;
25

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1 (k) generating a second average that represents an
2 average of brightness values of said first plurality of
3 neighboring pixels;

4 (l) updating said at least one counter based upon first
5 and second comparison operations, wherein said first
6 comparison operation compares said first average with
7 said brightness multiplying factor of said
8 corresponding watermarking element and said second
9 comparison operation compares said second average with
10 said brightness value of said corresponding pixel;

11 (m) repeating steps (i) through (l) for all color
12 planes;

13 (n) repeating steps (f) through (m) for all selector
14 elements;

15 (o) choosing a new selector position that does not
16 overlap any previous selector position;

17 (p) repeating steps (f) through (o) for all
18 non-overlapping selector positions; and

19 (q) generating a visual representation indicating
20 detection of said watermark in said marked image
21 utilizing said at least one counter of said selector
22 array and said visualizer pixels.

23 16. (Withdrawn) A method for detecting a watermarking plane
24 comprising the steps of:

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1 providing an image having a plurality of image pixels,
2 $u(i,j)$, with said image having I rows and J columns, and a pixel
3 in row i and column j having at least one component, marked by a
4 watermarking plane; said watermarking plane having a plurality of
5 watermarking elements, $w(i,j)$, with said watermarking plane
6 having I rows and J columns, and an element in row i and column j
7 having a brightness multiplying factor;

8 aligning said watermarking plane with said image;

9 identifying a subset of said image elements;

10 for each pixel, $u(i,j)$, of said subset of image pixels,

11 generating a first value representing a relationship
12 between an attribute of said pixel $u(i,j)$ and an
13 attribute of image pixels that neighbor said pixel
14 $u(i,j)$;

15 identifying a watermarking element, $w(i,j)$, that
16 corresponds to said pixel $u(i,j)$ and watermarking
17 elements that correspond to said image pixels that
18 neighbor said image pixel $u(i,j)$;

19 generating a second value representing a relationship
20 between an attribute of said watermarking element
21 $w(i,j)$ and an attribute of the identified watermarking
22 elements; and

23 generating a coincidence value representing a
24 likelihood that said image is marked by said
25 watermarking plane based upon said first and second
26 values.

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1 17. (Original) A method as recited in claim 1, wherein said
2 distinct watermarking element, has a value being in the domain
3 greater than or equal to zero and less than or equal to one.

4 18. (Withdrawn) A method for imparting a watermark onto a
5 digitized image comprising the steps of:

6 providing said digitized image comprised of a plurality
7 of image pixels with said digitized image having I rows
8 and J columns, and a pixel in row i and column j having
9 at least one component, $Y(i,j)$; and

10 adding to or subtracting from said brightness data
11 associated with at least one of said pixels a
12 predetermined brightness adding factor in the range of
13 0 to $Y(i,j)$, or brightness subtracting factor in the
14 range of 0 to $Y(i,j)$.

15 wherein said brightness adding or subtracting factor has a
16 relationship with a number taken from a random number sequence,
17 said relationship is a linear remapping to provide a desired
18 modulation strength, and said modulation strength is less than or
19 equal to 50 percent.

20 19. (Withdrawn) A method for imparting a watermark onto a
21 digitized image comprising the steps of:

22 providing said digitized image comprised of a plurality
23 of image pixels with said image having I rows and J
24 columns, and a pixel in row i and column j having at
25 least one component, $Y(i,j)$; and

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1 adding to or subtracting from said brightness data
2 associated with at least one of said pixels by a
3 predetermined brightness adding or subtracting factor
4 in the range of 0 to $Y(i,j)$,

5 wherein said brightness adding or subtracting factor has a
6 relationship with a number taken from a random number sequence,
7 said relationship is a linear remapping to provide a desired
8 modulation strength, said sequence is formed from a plurality of
9 robust watermarking parameters, and said parameters comprise a
10 cryptographic key, two coefficients and an initial value of said
11 random number generator.

12 20. (Withdrawn) A method for detecting a watermark, said method
13 comprising:

14 providing a marked image having a plurality of image pixels said
15 marked image being marked by a watermarking plane, having a
16 plurality of watermark elements;

17 aligning said watermarking plane with said marked image, and

18 generating a coincidence value by averaging a detection
19 coincidence for each selector element of a group of selector
20 elements taken from said image pixels.

21
22 21. (Withdrawn) A method as recited in claim 20, wherein each
23 of said group of selector elements has a selector size, said
24 method further comprising:

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1 providing a visualizer pattern having a plurality of visualizer
2 pixels and a visualizer size equal to said selector size, each of
3 said visualizer pixels being associated with one of said selector
4 elements and having a visualizer color; and

5 displaying a watermark detection pattern having a size at least
6 equal to said visualizer size and a plurality of
7 visualizer-coincidence pixels, wherein each of said
8 visualizer-coincidence pixels is associated with a corresponding
9 selector element and a corresponding visualizer pixel, and each
10 of said visualizer-coincidence pixels being displayed having said
11 visualizer color when said coincidence value of said
12 corresponding selected element has an indication of a detection
13 success and having another color otherwise.

14 22. (Withdrawn) A method as recited in claim 20 wherein said
15 watermark is based on a factor multiplying a brightness value of
16 each of said image pixels.

17 23. (Withdrawn) A method as recited in claim 20, further
18 comprising:

19 reconstructing said watermarking plane used in generating said
20 watermark.

21
22 24. (Withdrawn) A method as recited in claim 23, wherein said
23 watermarking plane has a plurality of watermarking elements, said
24 method further comprising:

25 rotating, resizing and said image to bring it to a size and
26 position of an original image, and

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1 aligning said watermarking plane with said marked image such that
2 each of said watermarking elements has a corresponding image
3 pixel.

4 25. (Withdrawn) A method as recited in claim 20, wherein each
5 said group contains 128 elements.

6 26. (Withdrawn) A method as recited in claim 20, wherein each
7 pixel of said image pixels has a monochrome brightness value.

8 27. (Withdrawn) A method as recited in claim 20, wherein said
9 watermarking plane is generated using a plurality of robust
10 watermarking parameters.

11 28. (Withdrawn) A method as recited in claim 20, wherein said
12 coincidence variable is determined using a statistically related
13 attribute relating each said selector element to a plurality of
14 neighboring elements.

15 29. (Withdrawn) A method as recited in claim 28, wherein said
16 attribute is a brightness value.

17
18 30. (Withdrawn) A method for detecting a watermark imparted on
19 an image, said method comprising:

20 providing said image having at least one image plane, said image
21 plane being represented by an image array having a plurality of
22 image elements, said watermark being formed using a watermarking
23 plane represented by a watermarking array having a plurality of
24 watermarking elements, each of said watermarking elements having
25 a first array position and having one-to-one positional
26 correspondence with said image elements;

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1 computing a first statistically related variable for each element
2 of at least one first grouping of a first selector array of
3 elements taken from said image elements, wherein each of said
4 image elements has a second array position;

5 computing a second statistically related variable for each
6 element of at least one second grouping of a second selector
7 array of elements taken from said watermarking elements, wherein
8 each element of said second selector array of elements has
9 one-to-one positional correspondence with said first selector
10 array, and wherein said correspondence forms combinations of
11 corresponding elements;

12 comparing to determine an affirmative and non-affirmative
13 likeness of said first and second statistically related variables
14 for each of said combinations of corresponding elements; and

15 forming at least one comparison array having one-to-one
16 correspondence with said at least one first grouping and having a
17 plurality of comparison elements, wherein each of said comparison
18 elements contains a positive detection indication for each
19 element of said first grouping when said step of comparing
20 results in an affirmative likeness, and a negative detection
21 indication for each element of said first grouping when said step
22 of comparing results in a non-affirmative likeness.

23 31. (Withdrawn) A method as recited in claim 30, wherein said
24 watermark is formed by adding or subtracting a brightness factor
25 of each of said image elements by an amount contained in a
26 corresponding element of said watermarking elements.

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1 32. (Withdrawn) A method as recited in claim 30, wherein said
2 first grouping corresponds to a selector positioned to encompass
3 said first selector array of elements forming a rectangular
4 cluster of elements.

5 33. (Withdrawn) A method as recited in claim 30, wherein said
6 first statistical variable is formed by comparing an attribute of
7 said each element of said first selector array of elements to an
8 average attribute of its 128 closest neighbors.

9 34. (Withdrawn) A method as recited in claim 30, wherein said
10 attribute is a ratio of the color component to the average of
11 neighboring color components in the same color plane. (Withdrawn)
12

13 35. (Withdrawn) A method as recited in claim 30, wherein each
14 of said at least one first grouping is positioned so as not to
15 overlap any other of said at least one first grouping.
16

17 36. (Withdrawn) A method as recited in claim 30, wherein each
18 said comparison elements has a particular position in said
19 comparison array, said method further comprising:

20 determining an average percentage of said affirmative and
21 non-affirmative likeness of each element of said comparison
22 elements having a same particular position in all arrays of said
23 at least one comparison array, and

24 forming a detection array of elements having one-to-one element
25 correspondence with said comparison elements, wherein each
26 element of said detection array of elements contains said average
27 percentage.

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1 37. (Withdrawn) A method as recited in claim 36, further
2 comprising the steps of:

3 providing a visualizer pattern of pixels represented by an array
4 having visualizer pixels which have one-to-one element
5 correspondence with said detection array, each of said visualizer
6 pixels has a first logical value if a corresponding visualizer
7 pixel is black, and a complementary logical value if said
8 corresponding pixel is white;

9 forming a visualizer coincidence image having a plurality of
10 coincidence pixels, wherein a coincidence pixel has a
11 corresponding visualizer pixel and a corresponding detection
12 array element; and

13 setting said coincidence pixel to black if both said
14 corresponding visualizer pixel is black and said percentage
15 average of said corresponding detection array element has a value
16 greater than a predetermined detection threshold, otherwise
17 setting said coincidence pixel to white.

18 38. (Withdrawn) A method as recited in claim 30, wherein said
19 image has three color planes.

20 39. (Withdrawn) A method comprising generating a visual
21 representation of a data array of data elements having a data
22 array size, including the steps of:

23 providing a visualizer pattern of visualizer pixels
24 represented by a visualizer array of visualizer pixels, said
25 visualizer array having a visualizer array size equal to
26 said data array size;

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1 forming a visualizer-coincidence image of image pixels
2 represented by an image array having an image array size
3 equal to said visualizer array size;

4 setting each said visualizer-coincidence pixel to the color
5 of said corresponding visualizer pixel if a value of said
6 corresponding data element is above a predetermined
7 threshold and to another color if said value is below said
8 predetermined threshold; and

9 displaying said visualizer-coincidence image to form said
10 visual representation.

11 40. (Withdrawn) A method as recited in claim 39, wherein said
12 data array represents data resulting from a watermark detection
13 implementation.

14 41. (Withdrawn) A method as recited in claim 39, wherein said
15 first color is black and said second color is white.

16 42. (Withdrawn) A method as recited in claim 39, wherein said
17 threshold is set at a fifty percent success rate.

18 43. (Withdrawn) A method for demonstrating an existence of a
19 watermark in a marked image, said image having a plurality of
20 image pixels, said method comprising:

21 providing a visualizer pattern represented by an array of
22 visualizer elements, each of said visualizer elements
23 corresponding with one pixel of a plurality of visualizer pixels
24 and having a first value if said one pixel has a first color and
25 a second value if said one pixel has a second color, said
26 visualizer array having a visualizer array size;

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1 implementing a watermark detection scheme and computing a
2 coincidence value for each of said image pixels within a
3 plurality of pixel selector arrays taken from among said image
4 pixels, each of said pixel selector arrays having a selector
5 array size equal to said visualizer array size;
6
7 forming a detection array from a plurality of coincidence values,
8 wherein said detection array has a detection array size equal to
9 said visualizer size; and

10 computing a coincidence detection value for each of said
11 visualizer elements such that said detection value represents a
12 visualizer.

13 44. (Withdrawn) A method for detecting a watermark in a marked
14 image having a plurality of image pixels, said marked image
15 marked by a watermarking plane having a plurality of watermarking
16 elements, said method comprising:

17 providing a visualizer pattern having a plurality of visualizer
18 pixels and a visualizer size;

19 aligning said watermarking plane with said marked image such that
20 each said image pixel has a corresponding watermarking element;

21 generating a statistically related variable for each image
22 element in a plurality of groupings of image elements in
23 relationship with said corresponding watermarking element;
24 wherein each of said groupings has a grouping size equal to said
25 visualizer size;

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1 averaging said variable for each element in a like position of
2 all of said groupings to obtain a composite detection success
3 value; and

4 displaying detection success values by a plurality of
5 visualizer-coincidence pixels having a size equal to said
6 visualizer size, each said visualizer-coincidence pixel having a
7 same color as said corresponding visualizer pixel when said
8 corresponding success value indicates detection success and
9 another color otherwise.

10 45. (Currently amended) A computer program product comprising a
11 computer usable medium having computer readable program code
12 means embodied therein for causing a watermark to be imparted
13 into an image, the computer readable program code means in said
14 computer program product comprising computer readable program
15 code means for causing a computer to effect the steps of ~~claim 1~~:
16 providing a digitized image having at least one image plane,
17 said image plane being represented by an image array having
18 a plurality of pixels, said pixel having at least one color
19 component, said watermark being formed using a distinct
20 watermarking plane represented by an array having a
21 plurality of distinct watermarking elements, each of said
22 distinct watermarking elements having an array position and
23 having one-to-one positional correspondence with said image
24 pixels, and

25 _____ multiplying said brightness data associated with said at
26 least one color component by a predetermined brightness
27 multiplying factor, wherein said brightness multiplying
28 factor is a corresponding distinct watermarking element, and
29 said watermark has a invisibility classification.

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1 46. (Currently amended) A computer program product comprising a
2 computer usable medium having computer readable program code
3 means embodied therein for causing a watermark to be imparted
4 into an image, the computer readable program code means in said
5 computer program product comprising computer readable program
6 code means for causing a computer to effect the steps of ~~claim 5~~:

7 providing said digitized image comprised of a plurality of
8 pixels, wherein each of said pixels includes brightness data
9 that represents a brightness of at least one color; and

10 altering said brightness data associated with a plurality of
11 said pixels maintaining the hue and saturation of said
12 pixel.

13 47. (Currently amended) A computer program product comprising a
14 computer usable medium having computer readable program code
15 means embodied therein for causing a watermark to be imparted
16 into an image, the computer readable program code means in said
17 computer program product comprising computer readable program
18 code means for causing a computer to effect the steps of ~~claim 11~~

19 :

20 providing said digitized image comprised of a plurality of
21 pixels, wherein each of said pixels includes brightness data
22 that represents a brightness of at least one color, with
23 said image having I rows and J columns, and a pixel in row i
24 and column j having a brightness $Y(i,j)$; and

25 for a plurality i and at least one j adding to or
26 subtracting from the brightness $Y(i,j)$ a random value
27 $e(i,j)$, wherein $1 \leq i \leq I$ and $1 \leq j \leq J$ are the row and
28 column indices of a pixel location in the image.

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1 48. (Currently amended) A computer program product comprising a
2 computer usable medium having computer readable program code
3 means embodied therein for causing generation of a watermarked
4 image, the computer readable program code means in said computer
5 program product comprising computer readable program code means
6 for causing a computer to effect the steps of ~~claim 13~~:

7 imparting a watermark onto a digitized image having a
8 plurality of original pixels, each of said pixels having at
9 least one original pixel brightness value;

10 providing said digitized watermarking plane comprising
11 a plurality of watermarking elements, each element
12 having a watermark brightness multiplying factor and
13 having one-to-one positional correspondence with said
14 original pixels; and

15 producing a watermarked image by multiplying said
16 original brightness of each of said original pixels by
17 said brightness multiplying factor of a corresponding
18 one of said watermark elements.

19 49. (Currently amended) A computer program product comprising a
20 computer usable medium having computer readable program code
21 means embodied therein for causing formation of a watermarking
22 plane, the computer readable program code means in said computer
23 program product comprising computer readable program code means
24 for causing a computer to effect the steps of ~~claim 14~~:

25 forming a watermarking plane including a plurality of elements
26 each having a brightness adding or subtracting factor, including
27 the steps of:

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1 generating a secure random sequence of integers having
2 a first plurality of bits;

3 linearly remapping said random sequence to form a
4 remapped sequence of brightness multiplying factors to
5 provide a desired modulation strength;

6 computing a discrete Fourier transform of said remapped
7 sequence to form a Fourier sequence having frequency
8 coordinates;

9 expanding said frequency coordinates to form an
10 expanded sequence;

11 computing an inverse discrete Fourier transform of said
12 expanded sequence to obtain a watermarking sequence of
13 values; and

14 deriving said brightness adding or subtracting values
15 of said elements of said watermarking plane based upon
16 said watermarking sequence of values.

17 50. (Currently amended) An article of manufacture comprising a
18 computer usable medium having computer readable program code
19 means embodied therein for causing detection of a watermark in a
20 marked image, the computer readable program code means in said
21 article of manufacture comprising computer readable program code
22 means for causing a computer to effect the steps of ~~claim 15:~~

23 providing said marked image marked by a watermarking plane,
24 said marked image having at least one color plane including
25 a plurality of image pixels, said watermarking plane having

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1 a plurality of watermarking elements, wherein each of said
2 image pixels has at least one brightness value and each of
3 said watermarking elements has a brightness adding and/or
4 subtracting factor, including the steps of:

5 (a) reconstructing said watermarking plane;

6 (b) aligning said watermarking plane with said marked
7 image such that each watermarking element has a
8 corresponding image pixel;

9 (c) providing a selector array and a visualizer image
10 of equal size, wherein said selector array has a
11 plurality of selector elements each having at least one
12 counter, and wherein said visualizer image has a
13 plurality of visualizer pixels each having at least one
14 brightness value, and wherein said visualizer pixels
15 represent a recognizable pattern when displayed;

16 (d) resetting said at least one counter to zero;

17 (e) placing said selector in an initial position by
18 aligning said selector elements with a plurality of
19 corresponding image pixels and a plurality of
20 corresponding watermarking elements;

21 (f) choosing a selector element and identifying a
22 corresponding watermarking element;

23 (g) identifying a first plurality of watermarking
24 elements that neighbor said corresponding watermarking
25 element;

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1 (h) generating a first average that represents an
2 average of brightness multiplying factors of said first
3 plurality of watermarking elements;

4 (i) choosing a color plane of said marked image and
5 finding a corresponding image pixel;

6 (j) identifying a first plurality of neighboring pixels
7 that neighbor said corresponding image pixel;
8 —

9 (k) generating a second average that represents an
10 average of brightness values of said first plurality of
11 neighboring pixels;

12 (l) updating said at least one counter based upon first
13 and second comparison operations, wherein said first
14 comparison operation compares said first average with
15 said brightness multiplying factor of said
16 corresponding watermarking element and said second
17 comparison operation compares said second average with
18 said brightness value of said corresponding pixel;

19 (m) repeating steps (i) through (l) for all color
20 planes;

21 (n) repeating steps (f) through (m) for all selector
22 elements;

23 (o) choosing a new selector position that does not
24 overlap any previous selector position;

25 (p) repeating steps (f) through (o) for all
26 non-overlapping selector positions; and

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1 (g) generating a visual representation indicating
2 detection of said watermark in said marked image
3 utilizing said at least one counter of said selector
4 array and said visualizer pixels.

5 51. (Withdrawn) An article of manufacture comprising a computer
6 usable medium having computer readable program code means
7 embodied therein for causing detection of a watermark in a marked
8 image, the computer readable program code means in said article
9 of manufacture comprising computer readable program code means
10 for causing a computer to effect the steps of claim 16.

11 52. (Withdrawn) An article of manufacture comprising a computer
12 usable medium having computer readable program code means
13 embodied therein for causing generation of a visual
14 representation of a data array of data elements, the computer
15 readable program code means in said article of manufacture
16 comprising computer readable program code means for causing a
17 computer to effect the steps of claim 39.

18 53. (Withdrawn) An article of manufacture comprising a computer
19 usable medium having computer readable program code means
20 embodied therein for causing a watermark to be imparted onto a
21 digitized image, the computer readable program code means in said
22 article of manufacture comprising computer readable program code
23 means for causing a computer to effect the steps of claim 18.

24 54. (Withdrawn) An article of manufacture comprising a computer
25 usable medium having computer readable program code means
26 embodied therein for causing a watermark to be imparted onto a
27 digitized image, the computer readable program code means in said

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1 article of manufacture comprising computer readable program code
2 means for causing a computer to effect the steps of claim 19.

3 55. (Withdrawn) An article of manufacture comprising a computer
4 usable medium having computer readable program code means
5 embodied therein for causing detection of a watermark imparted
6 onto a digitized image, the computer readable program code means
7 in said article of manufacture comprising computer readable
8 program code means for causing a computer to effect the steps of
9 claim 20.

10 56.. (Withdrawn) An article of manufacture comprising a computer
11 usable medium having computer readable program code means
12 embodied therein for causing detection of a watermark in a marked
13 image, the computer readable program code means in said article
14 of manufacture comprising computer readable program code means
15 for causing a computer to effect the steps of claim 30.

16 57. (Currently amended and Withdrawn) An article of manufacture
17 comprising a computer usable medium having computer readable
18 program code means embodied therein for causing generation of a
19 visual representation of a data array of data elements, the
20 computer readable program code means in said article of
21 manufacture comprising computer readable program code means for
22 causing a computer to effect the steps of claim ~~39~~ 40.

23 58. (Withdrawn) An article of manufacture comprising a computer
24 usable medium having computer readable program code means
25 embodied therein for causing demonstration of an existence of a
26 watermark in a marked image, the computer readable program code
27 means in said article of manufacture comprising computer readable
28 program code means for causing a computer to effect the steps of
29 claim 43.

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1 59. (Withdrawn) A computer program product comprising a computer
2 usable medium having computer readable program code means
3 embodied therein for causing detection of a watermark in a marked
4 image, the computer readable program code means in said computer
5 program product comprising computer readable program code means
6 for causing a computer to effect the steps of claim 44.

7 60. (Original) An apparatus to impart a watermark onto a
8 digitized image, said apparatus comprising mechanisms for
9 implementing the method of claim 1.

10 61. (Original) An apparatus for imparting a watermark onto a
11 digitized image comprising mechanisms for implementing the method
12 of claim 5.

13 62. (Original) An apparatus for imparting a watermark onto a
14 digitized image comprising mechanisms for implementing the method
15 of claim 6.

16 63. (Original) An apparatus for imparting a watermark onto a
17 digitized image comprising mechanisms for implementing the method
18 of claim 11.

19 64. (Original) A method for detecting a watermark in a marked
20 image, said method comprising:

21 providing said marked image having said watermark;

22 altering said marked image employing a blurring filter in
23 producing a filtered image; and

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1 employing a watermark detection method upon said filtered image
2 to detect said watermark.

3 65. (Original) A method for detecting a watermark in a marked
4 image, said method comprising:

5 providing said marked image having said watermark;

6 processing the marked image and producing a screened image;

7 altering said screened image employing a blurring filter in
8 producing a filtered image; and

9 employing a watermark detection method upon said filtered image
10 to detect said watermark.

11 66. (Original) A method as recited in claim 65, wherein the step
12 of processing includes producing a derivative image by screening,
13 printing and scanning the marked image.

14 67. (Original) A method as recited in claim 15, wherein the step
15 of aligning includes altering said marked image employing a
16 blurring filter.

17 68. (Withdrawn) A method as recited in claim 16, wherein the step
18 of aligning includes altering said marked image employing a
19 blurring filter.

20 69. (Withdrawn) A method as recited in claim 20, wherein the step
21 of aligning includes altering said marked image employing a
22 blurring filter.

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1 70. (Withdrawn) A method as recited in claim 30, wherein the step
2 of providing includes altering said marked image employing a
3 blurring filter.

4 71. (Withdrawn) A method as recited in claim 44, wherein the step
5 of aligning includes altering said marked image employing a
6 blurring filter.

7 72. (Withdrawn) An article of manufacture as recited in claim 51,
8 wherein the step of aligning includes altering said marked image
9 employing a blurring filter.

10 73. (Withdrawn) An article of manufacture as recited in claim 59,
11 wherein the step of aligning includes altering said marked image
12 employing a blurring filter.

13 74. (Original) An apparatus as recited in claim 61, wherein the
14 means of providing includes means for altering said marked image
15 employing a blurring filter.

16 75. (Withdrawn) A method of generating a visual
17 representation of a data array of data elements having a data
18 array size, said method comprising:

19 providing a visualizer pattern of visualizer pixels represented
20 by a visualizer array of visualizer elements, said visualizer
21 array having a visualizer array size equal to said data array
22 size, wherein each of said visualizer elements has a first
23 logical value if a corresponding visualizer pixel is a first
24 color and a complementary logical value if said corresponding
25 visualizer pixel has a second color;

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1 forming a data image of image pixels represented by an image
2 array having an image array size equal to said data array size,
3 wherein an image pixel has a corresponding data element and a
4 corresponding visualizer pixel;

5 setting said data pixel to a color of said corresponding
6 visualizer pixel if a value of said data element is above a
7 predetermined threshold and to another color if said value is
8 below said predetermined threshold; and

9
10 displaying said data image to form said visual representation.

11 76. (Withdrawn) A method as recited in claim 75, wherein said
12 data array represents data resulting from a watermark detection
13 implementation.

14 77. (Withdrawn) A method as recited in claim 75, wherein said
15 first color is black and said second color is white.

16 78. (Withdrawn) A method as recited in claim 75, wherein said
17 threshold is set at a fifty percent success rate.

18 79. (Withdrawn) An article of manufacture comprising a computer
19 usable medium having computer readable program code means
20 embodied therein for causing generation of a visual
21 representation of a data array of data elements, the computer
22 readable program code means in said article of manufacture
23 comprising computer readable program code means for causing a
24 computer to effect the steps of claim 75.

25 80. (Withdrawn) A computer program product comprising a computer
26 usable medium having computer readable program code means
27 embodied therein for causing generation of a visual

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1 representation of a data array of data elements, the computer
2 readable program code means in said computer program product
3 comprising computer readable program code means for causing a
4 computer to effect the steps of claim 75.

5 81. (Original) An apparatus for generating a watermarked image
6 comprising mechanisms for implementing the method of claim 13.

7 82. (Original) An apparatus comprising mechanisms for
8 implementing the method of claim 14.

9 83. (Original) An apparatus for detecting a watermark in a marked
10 image comprising mechanisms for implementing the method of claim
11 15.

12 84. (Withdrawn) An apparatus for detecting a watermarking plane
13 comprising mechanisms for implementing the method of claim 16.

14 85. (Withdrawn) An apparatus for imparting a watermark onto a
15 digitized image comprising mechanisms for implementing the method
16 of claim 19.

17 86. (Withdrawn) An apparatus for detecting a watermark comprising
18 mechanisms for implementing the method of claim 20.

19 87. (Withdrawn) An apparatus for detecting a watermark comprising
20 mechanisms for implementing the method of claim 30.

21 88. (Withdrawn) An apparatus for demonstrating an existence of a
22 watermark in a marked image comprising mechanisms for
23 implementing the method of claim 43.

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1 89. (Withdrawn) An apparatus for detecting a watermark comprising
2 mechanisms for implementing the method of claim 44.

3 90. (Withdrawn) A method for detecting a watermarking plane
4 comprising the steps of:

5 providing an image having a plurality of image pixels,
6 $u(i,j)$, with said image having I rows and J columns, and a pixel
7 in row i and column j having at least one component, marked by a
8 watermarking plane; said watermarking plane having a plurality of
9 watermarking elements, $w(i,j)$, with said watermarking plane
10 having I rows and J columns, and an element in row i and column j
11 having a brightness multiplying factor;

12 aligning said watermarking plane with said image;

13 identifying a subset of said image elements; and

14 for each pixel, $u(i,j)$, of said subset of image pixels,
15 employing a detection scheme in determining a probability of
16 watermark detection based on a property of uniform
17 distribution of the random brightness multiplying factors or
18 the random brightness adding or subtracting factors.